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Climate Change Science Program

Guidelines for Producing CCSP Synthesis and Assessment Products

The CCSP Synthesis and Assessment Products

The U.S. Climate Change Science Program (CCSP) is producing synthesis and assessment products to support informed discussion and decision making regarding climate variability and change by policy makers, resource managers, stakeholders, the media, and the general public. The CCSP participating agencies are coordinating their work to produce these reports, which will integrate research results focused on identified science issues and related questions frequently raised by decision makers. These reports will provide current evaluations of the identified science foundation that can be used for informing public debate, policy development, and operational decisions, and for defining and setting the future direction and priorities of the program. The CCSP products will be considered Federal government disseminations, thus they must be prepared in conformance with the provisions of the Data Quality Act (Section 515 of the Treasury and General Government Appropriations Act of 2001). Any agency sponsoring or contributing to the development of a product must certify that the agency's contribution satisfies its Information Quality Guidelines.

Purpose of the Guidelines

The CCSP Strategic Plan sets forth general principles for its approach to preparing synthesis and assessment products:

- Analyses structured around specific questions
- Early and continuing involvement of stakeholders
- Explicit treatment of uncertainties
- Transparent public review of analysis questions, methods, and draft results
- Adoption of a "lessons learned" approach, building on the ongoing CCSP analyses.

The purpose of this document is to present guidelines that address the three steps in the process of preparing the synthesis and assessment products: developing the prospectus, drafting and revising the document, and final approval and publication of each product. The guidelines set forth the roles of participants and the steps in the process. The guidelines are intended to ensure that:

- Independent scientific judgment serves as the guiding force in preparing the products so they are credible
- Scientists, users, and other stakeholders jointly determine the scope of the products so the topics covered are well defined and the information provided is relevant to the needs expressed
- The process of preparing the products is open at every step so the products have legitimacy (i.e., are perceived to have been prepared fairly).

Participants and Their Roles

CCSP Interagency Committee

CCSP was established by the President in 2002 and integrates the U.S. Global Change Research Program and the Climate Change Research Initiative. The CCSP Interagency Committee provides executive direction for the Program, as described in Chapter 16, "Program Management and Review," of the CCSP Strategic Plan. CCSP's Interagency Committee is chaired by the CCSP Director (a Department of Commerce appointee) and includes representatives of 13 participating departments/agencies that have mission or funding responsibilities in climate and global change research, together with liaisons from the Executive Office of the President.[1] Membership on the CCSP Interagency Committee is joint with the Subcommittee on Global Change Research (SGCR) of the Committee on Environment and Natural Resources (CENR) of the President's National Science and Technology Council (NSTC). The CCSP Interagency Committee has overall responsibility for direction of the program, including compliance with the requirements of the Global Change Research Act of 1990. With respect to the synthesis and assessment products, the CCSP Interagency Committee provides oversight for the process of preparing the products as described in these guidelines.

Lead Agency(ies)/Department(s)

One or more designated CCSP agency(ies) or department(s) will take the lead in producing each product. The lead agency(ies) will be responsible for developing an open and transparent process for soliciting user input, author nomination and selection, expert peer review and public comment, and production/release of the products, as described in these guidelines. To ensure that the products incorporate as much expertise as possible, the lead agency(ies) will be open to the participation of other individuals or entities with relevant expertise and information. The entities can include other government units (Federal or non-Federal), Interagency Working Groups of the CCSP or other Federal programs, international organizations and government units, non-governmental organizations (NGOs), and other groups.

[1] Participating departments and agencies include: Department of Agriculture (USDA), Department of Commerce / National Oceanic and Atmospheric Administration (DOC/NOAA), Department of Defense (DOD), Department of Energy (DOE), Department of Health and Human Services (HHS), Department of the Interior / U.S. Geological Survey (DOI/USGS), Department of State (DOS), Department of Transportation (DOT), Agency for International Development (USAID), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Science Foundation (NSF), and Smithsonian Institution (SI). In addition, the Executive Office of the President and other related programs have designated liaisons who participate on the CCSP Interagency Committee: Office of Science and Technology Policy (OSTP), Council on Environmental Quality (CEQ), Office of Management and Budget (OMB), Climate Change Technology Program (CCTP), and Office of the Federal Coordinator for Meteorology (OFCM).

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Lead and Contributing Authors

Lead and contributing authors of the synthesis and assessment products are scientists or individuals with recognized technical expertise appropriate to a product. Lead and contributing authors may be citizens of any country and be drawn from within or outside the Federal government (e.g., universities or other public or private sector organizations). These individuals shall be acknowledged experts, known through their publication record and relevant accomplishments and contributions to their field. Lead authors are responsible for the content of the synthesis and assessment products that are submitted to the CCSP Interagency Committee for review.

Interagency Working Groups

The CCSP Interagency Committee coordinates implementation of its activities in support of the Strategic Plan through Interagency Working Groups (IWGs) of program specialists of its participating departments and agencies, as described in Chapter 16, "Program Management and Review," of the CCSP Strategic Plan. IWGs will contribute significantly to the preparation of the synthesis and assessment products because of their expertise in areas related to the products. IWGs may serve as a means for the lead agency(ies) to coordinate preparation of the products with supporting agencies. They may contribute to planning/preparing the prospectuses, scoping, drafting, reviewing, publishing, or disseminating the final product.

Expert Reviewers

Expert reviewers are scientists or individuals with other special expertise appropriate to a product. The expert reviewers will be selected by the lead agency(ies)/departments. As is the case for lead and contributing authors, reviewers may be citizens of any country and be drawn from within or outside the Federal government (e.g., universities or other public or private sector organizations). These individuals shall be known through their publications and other forms of recognition of their expertise. Expert reviewers will focus on the scientific/technical content of the draft. Employees of the lead agency(ies), lead authors, and other contributors to the product may not serve as expert reviewers for that product. The expert reviewers will be designated through a process described in the prospectus.

Stakeholders

Stakeholders are defined as they are in Chapter 11 of the CCSP Strategic Plan—that is, "Stakeholders are individuals or groups whose interests (financial, cultural, value-based, or other) are affected by climate variability, climate change, or options for adapting to or mitigating these phenomena."[2] Stakeholders participate during the scoping process by providing information that helps define the audience and potential uses of a product. In addition, stakeholders provide comments on the prospectus, and on the product during the

[2] See Box 11-1 ("Working Definitions"), page 112 of the CCSP Strategic Plan.

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public comment period. These comments are expected to focus on how well the product serves its intended purpose or use.

National Research Council

The National Academy of Sciences / National Research Council (NRC) will provide advice on an as-needed basis to the lead agency(ies). In the event that issues are identified that require further clarification, the NRC may be asked to provide additional scientific analyses to help bound the uncertainty associated with these issues.

National Science and Technology Council

The National Science and Technology Council (NSTC) will be responsible for final review and approval of the synthesis and assessment products. Products not cleared by NSTC cannot be released as disseminations of the Federal government. Consistent with NSTC procedures, approvals will require written concurrence from all members of the NSTC's Committee on Environment and Natural Resources (CENR). All comments generated through the NSTC review will be addressed by the CCSP Interagency Committee. The CENR membership includes senior officials representing the Executive Office of the President and the 15 federal agencies with significant responsibilities for environment and natural resources programs.

Steps of the Process

Planning the Process and Preparing a Prospectus

1. The lead agency(ies) solicit input from users and other stakeholders, plan preparation of the product, and summarize the proposed process in a draft prospectus. The draft prospectus will address the topics listed in the subsequent section of this document.
2. The CCSP Interagency Committee reviews and approves the draft prospectus for public comment.
3. Expert reviewers and stakeholders review the draft prospectus. The prospectus comment period will last at least 30 days. The draft prospectus comment period will be announced in a Federal Register Notice (FRN) and posted on the CCSP web site.
4. The lead agency(ies) revise the draft prospectus and finalize author recommendations, taking into consideration the comments received.
5. The CCSP Interagency Committee approves the revised prospectus and the lead agency(ies) notify the lead authors.
6. The CCSP Office posts the draft prospectus comments and the final prospectus on the CCSP web site.

Additional Stakeholder Interactions, if Needed

7. Lead authors may solicit additional input from users and other stakeholders to assist in the development of the product. The process for soliciting this additional input will be open and described in the prospectus. Approaches include workshops, user

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surveys, telephone and email conferences, and other mechanisms. The processes used will reflect the expected end use of the product. The CCSP Strategic Plan identifies three end uses for CCSP synthesis and assessment products: 1) informing the evolution of the research agenda; 2) supporting adaptive management and planning; and 3) supporting policy formulation. The products with end uses primarily oriented toward the second and third categories are expected to require significant additional input from users to develop a clear understanding of information needs, timing of decisions, consideration of how uncertainty affects decision making, and other issues. The results from additional stakeholder interactions will be publicly available in summary or more extensive forms through publication on the CCSP web site.

Drafting/Reviewing the Products

8. Lead authors prepare the first draft, including a technical section and a summary for interested non-specialists.
9. The lead agency(ies) organize and facilitate an expert peer review of the first draft according to process described in the prospectus. The expert peer review will precede the public comment period to ensure that the products are shaped by scientific considerations. The expert peer review process may range from that used in a scientific journal to a formal review panel convened by the lead agency or recognized external groups such as the National Research Council. Participants must be qualified scientific/technical experts, as demonstrated by their record of scholarly publication and other accomplishments. Employees of the lead agency(ies), lead authors, and other contributors to the product may not serve as expert reviewers for that product. The prospectus will describe the process for selecting expert reviewers and the expected dates of the review. If the expert peer review is open to all qualified experts, notice will be disseminated on the CCSP web site and through relevant scientific publications, web sites, and other means. All comments submitted during the expert peer review will be publicly available without attribution to the reviewer unless reviewers agree in advance to posting with specific attribution.
10. Lead authors prepare the second draft of the product, taking into consideration the expert peer review comments. The scientific judgment of the lead authors will determine responses to the comments. The authors will acknowledge significant contributions made by expert reviewers, as applicable.
11. The lead agency(ies) post the second draft of the product for public comment for not less than 45 days. Any stakeholders (plus experts who participated in the expert peer review process) may participate in the public comment period for the second draft. This includes governmental and non-governmental entities. The prospectus will include the expected dates of the public comment period. Notice of the public comment period will be disseminated on the CCSP web site, in the Federal Register, and through other publications, web sites, and means as appropriate to the product, to encourage wide public participation in the review. All comments will be publicly available.
12. The lead authors will prepare a third draft of the product, taking into consideration the comments submitted during the public comment period. The scientific judgment of the lead authors will determine responses to the comments.

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Approving, Producing, and Releasing the Products

13. Lead agency(ies) submit the third draft of the product and a compilation of comments received to the CCSP Interagency Committee.
14. If the CCSP Interagency Committee review determines that no further action is needed and that the product has been prepared in conformance with these guidelines and the Data Quality Act (including ensuring objectivity, utility, and integrity as defined in 67 FR 8452), they will submit the product to NSTC for approval. If the CCSP Interagency Committee determines that further revision is necessary, their comments will be sent to the lead agency(ies) for consideration and resolution by lead authors.
15. If needed, NRC can be asked to provide additional scientific analysis to bound scientific uncertainty associated with specific issues.
16. Once the CCSP Interagency Committee has determined that the synthesis and assessment report has been prepared in conformance with these guidelines and the Data Quality Act, the Committee will submit it to NSTC for final review and approval. Approval will require the concurrence of all members of the Committee on Environment and Natural Resources. Comments generated during the NSTC review will be addressed by the CCSP Interagency Committee.
17. Once NSTC approval has been obtained and the product is finalized, the lead agency(ies) will produce and release the completed product using a standard format for all CCSP synthesis and assessment products. The final product and the comments received during the expert review and the public comment period will be posted, without attribution (unless specific reviewers agree to attribution), on the CCSP web site.
18. The product will be widely disseminated through the CCSP web site and other mechanisms.

Contents of the Prospectus

The proposed process for preparing each CCSP synthesis and assessment product will be summarized in a prospectus that will be publicly available. The prospectus for each product will typically be 5-10 pages in length (plus appendices with references and biographical information for proposed lead authors) and will address the following points:

- Overview: description of topic, audience, intended use, questions to be addressed, etc.
- Contact information: email and telephone for responsible individuals at the lead and supporting agencies
- Lead authors: required expertise of lead authors and biographical information for proposed lead authors
- Stakeholder interactions: process already used to solicit input from users and other stakeholders, or proposed plans for doing so, including information for those interested in participating in this process
- Drafting: materials to be used in preparing the product

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- Review: the processes through which the product will receive expert peer review and public comment, including the process for selecting expert reviewers and the scheduled dates for the expert peer review and public comment periods
- Related activities: description of how preparation of the product will be coordinated with related activities, including other national or international assessment processes (e.g., the Intergovernmental Panel on Climate Change)
- Communications: proposed method of publication and dissemination of the product
- Proposed timeline.

Materials to be Used

Authors will use the published, peer-reviewed scientific literature in drafting the products. In the rare case that any materials used in preparing a product are not already published in the peer-reviewed literature, the lead agency(ies) must get approval from the CCSP Interagency Committee and these materials must be made available by the lead agency(ies) and/or CCSP Office. The use of any such non-peer-reviewed materials may be questioned by reviewers during the expert review or public comment period. Authors should seek to publish any materials used in preparing drafts of the products.

Characteristics of the Products

The products will identify disparate views that have significant scientific or technical support. They will also provide confidence levels for key findings, if this is appropriate to the product.

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MEMORANDUM

TO: CENR and CCSP Principals
(see Appendix, which lists these individuals)

FROM: William Brennan, Acting Director, U.S. Climate Change Science Program

RE: Clarification of review and clearance process for CCSP Synthesis and Assessment Products

Based on "lessons learned" from moving the first few CCSP synthesis and assessment products through the final review and clearance stages, this memorandum provides clarifications to the CCSP "Guidelines for Producing Synthesis and Assessment Products" (<http://www.climatescience.gov/Library/sap/sap-guidelines.htm>).

ROLE OF THE PRODUCT AUTHORS

The lead and contributing authors are responsible for drafting the product. The Guidelines make a clear distinction among the respective roles of authors, expert reviewers, and stakeholders. Contributors may not serve as expert reviewers. All comments pertaining to the content of the product that arise at any stage will be referred to the lead author(s). These stages include the expert review, public comment period, as well as the final clearance stages by the lead agency, CCSP, and NSTC. Any changes that are proposed for the product's contents will be reviewed by the lead author(s) to ensure that the scientific and technical intent is maintained. Therefore, the authors must remain available to address comments that arise throughout the process, including the final CCSP and CENR clearance stage.

It is important that the authors adhere closely to the terms of the product described in the prospectus. Consistent with the principles underpinning National Research Council studies: "The rationale for any findings, conclusions, and recommendations should be fully explained in the report. This explanation might include references to the literature, analysis of data, or a description of the pros and cons of the range of alternatives and the reasons for preferring a particular option. Failure to document conclusions and recommendations adequately is the most common shortcoming of draft reports. Recommendations calling for organizational changes, adoption of new policies or positions, or budgetary increases within government agencies should be avoided..."[1]

ROLE OF THE LEAD AGENCY

Product Review and Clearance

The CCSP "Guidelines for Producing Synthesis and Assessment Products" indicate that following the expert review and public comment stages, the "*lead agency(ies) submit the*

[1] From *Guidelines for the Review of National Research Council Reports*, 2003.

third draft of the product and a compilation of comments received to the CCSP Interagency Committee." Three clarifications are made below with respect to this statement.

First, although there may be multiple contributing agencies to a given synthesis and assessment product, a single lead agency must take responsibility for ensuring compliance with the Information Quality Act (IQA), and if applicable, the Federal Advisory Committee Act (FACA).

Second, when the lead agency transmits the product for final clearance, they should include a memorandum briefly indicating that *"the product was prepared in compliance with CCSP's Guidelines for Producing Synthesis and Assessment Products, the Information Quality Act (Section 515) and [LEAD AGENCY'S] corresponding IQA guidelines; and the Federal Advisory Committee Act [when applicable]."* This transmittal should include the authors' responses to the peer reviewer comments, as required by OMB's Information Quality Bulletin for Peer Review, as well as descriptions of how the authors addressed the public comments and lead agency's review comments.

Third, to help expedite the clearance process, CCSP and NSTC clearance steps are conducted simultaneously. The lead agency will therefore simultaneously transmit the necessary materials to both. These materials include: the third draft of the product; the expert review comments and the author's responses to them; the public comments and the author's responses to them; and the aforementioned transmittal memorandum.

To further expedite the process, the lead agency is encouraged to submit comments it has concerning the report's contents during the public comment stage. The lead agency should not convene an expert review in addition to the one conducted as part of the report production process.

The lead agency is responsible for informing the authors what their role is in each stage of the product development, review, public comment, and clearance process, and helping to ensure that the authors remain engaged through the final clearance process.

The lead agency will inform the authors of the steps that are required to comply with the lead agency's Information Quality Act guidelines as well as the Information Quality Bulletin for Peer Review, and ensure that the authors follow those steps.

Use of FACA (The Federal Advisory Committee Act)

The determination of whether a FACA Committee is needed rests with the lead agency. When a FACA Committee is required, the lead agency is responsible for establishing the FACA charter and the process for appointing FACA Committee members. Note that there are other statutory requirements applicable to FACA Committees, such as those governing Federal Register announcements when a FACA Committee meets, and each lead agency is expected to comply with any relevant FACA guidelines. It is also important to note that the role of a FACA Committee is to provide advice to the lead

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agency on the SAP; the SAP is not a product of the FACA Committee, nor is the SAP that is released by the Lead Agency subject to approval by a FACA Committee. However, any requests for changes to the product's contents that arise in the clearance stage will be referred back to the lead author(s). Any changes that are proposed for the product's contents will be reviewed by the lead author(s) to ensure that the scientific and technical intent is maintained.
The report is prepared by the lead agency and is ultimately a product of CCSP, a component of the federal government. Therefore, it is essential that agencies authoring SAPs who choose to invoke a FACA process carefully review the FACA Committee advice and take whatever steps are necessary to stand behind the process used to prepare the report and the conclusions therein. In other words, the lead agency must "own" the report.

Communications

The lead agency is responsible for developing and executing a communications plan for each product. Particular attention should be given to the rollout plan, which will describe the strategy used for the release of the report to the public. It is recommended that the communication plan be developed early in the product production cycle. When applicable, it should describe the approaches for obtaining stakeholder input during the production of the product, including during the public comment period. It should also describe how and to whom the product will be communicated following its completion. The plan should allow for flexibility in planning communications-related activities given the possibility of changing timetables. The plan should be developed in consultation with the lead agency's public affairs and communications offices, and should draw from the "best practices" document maintained by CCSP's Communications Interagency Working Group. The plan should be communicated to the Executive Office of the President (EOP) and the CCSP Office.

ROLE OF CCSP AND NSTC

The Global Change Research Act of 1990 requires "the Council [NSTC], through the Committee [CENR]" to deliver scientific assessment products to the President and Congress. Accordingly, the NSTC and CENR must review the assessment products prior to their release. Pursuant to the Act, the CCSP clearance process will occur via the NSTC, and will be conducted through the CENR.

Because CCSP and NSTC clearance will be conducted simultaneously, and because some agencies have members on both the CCSP Principals Interagency Committee and the CENR, those agencies should coordinate their clearances so that each agency provides only one clearance.

The CCSP/CENR clearance will rely on the lead agency's certification regarding compliance with CCSP's "Guidelines for Producing Synthesis and Assessment Products," FACA, and IQA (including the Bulletin for Peer Review). As such, an additional expert review is not expected. The focus of the CCSP/CENR clearance is to ensure that the

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policy officials with legal responsibility for the documents have reviewed and approved them, with particular consideration of issues such as:

- The product does not misstate any policies or positions of the United States or any of its federal agencies. (The synthesis and assessment products are intended to be policy-relevant, not policy-prescriptive.)

- The product clearly communicates its main message to its intended audiences and includes sufficient context for members of the lay public who are interested in the science to understand the product's relevance.

- The expert review and public comments were adequately addressed by the authors.

Any requests for changes to the product's contents that arise in the clearance stage will be referred back to the lead author(s). Any changes that are proposed for the product's contents will be reviewed by the lead author(s) to ensure that the scientific and technical intent is maintained.

PUBLIC ACCESS TO DOCUMENTS

The following is the minimum set of documents that are posted on the web page for each of the synthesis and assessment products (http://www.climatescience.gov/Library/sap/sap-summary.php)

- invitation for public comment on draft prospectus
- draft prospectus
- public comments on draft prospectus
- final prospectus
- peer review plan (if not part of the prospectus)
- expert review comments on first draft report and authors' responses to them
- invitation for public comment on second draft report
- second draft report
- public comments on second draft report and authors' responses to them
- third draft report
- final report

Additional information is often posted for each product.

EXECUTIVE SUMMARY FOR THE PRODUCTS

Each product should include an executive summary. An effective executive summary contains enough information for the reader to become acquainted with the full document without actually reading it. It should briefly summarize: the key issue(s) being addressed by the product; the background and context of the issue(s); and the major conclusions. Recognizing that the 21 synthesis and assessment products are scientific in nature, the executive summary should be written for a non-expert (e.g., to the level of an informed

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high school graduate) and minimize the use of technical terminology and graphs and figures. It is recommended that the executive summary be no more than eight pages in length.

It is up to the discretion of the author teams whether or not to also produce an abstract that succinctly distills the essence and key take-home messages of the report.

Both the executive summary and the abstract (if included) are independent elements and should undergo the same review and clearance as required for the full report.

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APPENDIX

CENR ROSTER

George Gray
U.S. Environmental Protection Agency Headquarters

Conrad Lautenbacher
National Oceanic and Atmospheric Administration

Sharon Hays
Office of Science and Technology Policy
Executive Office of the President

Michael Freilich
National Aeronautics and Space Administration

Jonathan Perlin
U.S. Department of Veterans Affairs

James Connaughton
Council on Environmental Quality

Vacant
U.S. Department of Energy

Robert Foster
Office of the Secretary of Defense

Mark Myers
U.S. Geological Survey
Department of the Interior

Leonard Hirsch
Smithsonian Institution

Kathryn Jackson
River System Operations & Environment
Tennessee Valley Authority

Gale Buchanan
Research, Education, and Economics
U.S. Department of Agriculture

Linda Lawson
Safety, Energy and Environment

Department of Transportation

Kathie Olsen
National Science Foundation

Vacant
U.S. Department of Housing & Urban Development

David Schwartz
U.S. Department of Health & Human Services

David Anderson
The Office of Management and Budget
Executive Office of the President

Bruce Davis
U.S. Department of Homeland Security

Vacant
U.S. Department of Labor

Claudia McMurray
Bureau of Oceans and Int'l Environmental & Scientific Affairs
U.S. Department of State

Samuel Williamson
Federal Coordinator for Meteorology

EOP CC list
Chase Hutto
Office of the Vice President

Ted Wackler
Office of Science and Technology Policy
Executive Office of the President

Marty Hall
Council on Environmental Quality
Executive Office of the President

Other CC list
Marta Cehelsky
Executive Secretary
NSTC Committee on Science and
Senior Adviser, Office of the Director
National Science Foundation

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CCSP roster

William Brennan, Acting Director
National Oceanic and Atmospheric Administration
Department of Commerce

Jack Kaye, Vice Chair
HQ/Earth Sun System Division
National Aeronautics and Space Administration

Allen Dearry
National Toxicology Program
National Institute of Environmental Health Sciences
National Institutes of Health

Jerry Elwood
Climate Change Research Division
Department of Energy

Mary Glackin
National Oceanic and Atmospheric Administration
Department of Commerce

Patricia Gruber
Office of Naval Research
Department of Defense

William Hohenstein
Global Change Program Office
U.S. Department of Agriculture

Linda Lawson
Safety, Energy and Environment
Department of Transportation

Jarvis Moyers
Geosciences Directorate
National Science Foundation

Mark Myers
U.S. Geological Survey
Department of the Interior

Patrick Neale
Smithsonian Environmental Research Center.

Smithsonian Institution

Jacqueline Schafer
Bureau for Economic Growth, Agriculture, and Trade
U.S. Agency for International Development

Joel Scheraga
National Center for Environmental Assessment
U.S. Environmental Protection Agency

Harlan Watson
Department of State

Executive Office and other Liaisons to the CCSP Principals Committee

Melissa Brandt
Office of Management and Budget
Executive Office of the President

Stephen Eule
Climate Change Technology Program
U.S. Department of Energy

Katharine Gebbie
National Institute of Standards & Technology

Margaret McCalla
Office of the Federal Coordinator for Meteorology

George David Banks
Council on Environmental Quality
Executive Office of the President

Gene Whitney
Office of Science and Technology Policy
Executive Office of the President

Staff

Peter Schultz
Climate Change Science Program Office

Fabien Laurier
Climate Change Science Program Office

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Guidance to Agency Leads Regarding the Preparation of CCSP Synthesis and Assessment Products

1. General guidance

General guidance on preparing a Synthesis and Assessment Product (SAP) is posted on the CCSP website. A PDF version is available by clicking on the following link: http://www.climatescience.gov/Library/sap/sap-guidelines.pdf. CCSP has formed a work group to assist in the preparation of the SAP's. This work group, known as the Synthesis and Assessment Product Advisory Group (SAPAG), has representatives from every agency that is leading in the development of an SAP [1]. The purpose of this communication is to provide additional information and clarification on the production of the SAP's.

2. Instructions on the length of an executive summary

Each SAP is to include an abstract and an executive summary. An effective executive summary contains enough information for the readers to become acquainted with the full document without actually reading it. Usually, it contains a statement of the problem, some background information, the context of the study and the major conclusions. Recognizing that the 21 SAP's are scientific in nature, the executive summary should be written to the level of a high school graduate and minimize the use of technical jargon and complicated graphs and figures. We are recommending that the executive summary be no more than eight pages in length. Both the executive summary and the abstract are independent elements.

With the possible exception of the conclusion and recommendation, the executive summary is the most important part of a report. As such, it should be the best-written and most polished piece of the document. This is because many readers may only look at the executive summary when deciding whether or not to read the entire document. Since the executive summary is a condensation, when creating it, you should omit any preliminaries, details, and illustrative examples. You would include the main ideas, the facts, the necessary background to understand the problem, and the major conclusions. Brevity and conciseness are the keys to a well-written summary.

Do not take a few sentences from key sections of the document and string them together. Rather, go over the entire document and make notes of the elements you consider important. From your notes, create a rough draft of the summary. Then, polish what you have written until it is smooth and seamless without unnecessary wordiness. Finally, ensure that your executive summary is accurate and representative of your full document. It should not be misleading, but it should give readers the same impression as if they had read the entire report. The Executive Summary is to be produced by the author team and would undergo the same review and clearance procedures required of the overall body of the SAP.

The Communications IWG has volunteered to help you with this process. Please contact the CIWG if you would like their assistance in producing the Executive Summary or providing an independent check on its readability. The Co-Chairs are Kent Laborde, NOAA (kent.laborde@noaa.gov) and Jason Samenow, EPA (samenow.jason@epa.gov), and the CIWG coordinator is Nick Sundt, CCSPO (nsundt@usgcrp.gov).

3. Peer Review

As the agency lead for a Synthesis and Assessment Product you are responsible for conducting a formal peer review of the report. You must follow your agency's guidelines for peer review that are consistent with OMB's Final Information Quality Bulletin for Peer Review (http://www.whitehouse.gov/omb/inforeg/peer2004/peer_bulletin.pdf). This Bulletin establishes minimum standards for peer review and was issued under the Information Quality Act and the OMB's general authorities to oversee the quality of agency information, analyses, and regulatory actions. All of the 21 SAP's are determined to be "Highly Influential Scientific Assessments" and the OMB Bulletin details specific procedures and requirements for conducting peer review including the desire to conduct the peer review as a panel rather than a letter review, the timing of the review, the scope, the selection of reviewers (expertise and balance, conflicts, independence), public participation and disposition of comments. Note that this OMB bulletin calls for a peer review plan for your assigned SAP. These peer review plans may be included in your prospectus, but it must also be posted on your agency's website, pursuant to the Information Quality Peer Review Bulletin. Although the CCSP will be posting the prospectuses and final reports, the posting of peer review plans is left up to each agency.
If you choose to post an intermediate draft of the SAP on your own agency's website, please be sure and include the following disclaimer as required by the OMB bulletin:

THIS INFORMATION IS DISTRIBUTED SOLELY FOR THE PURPOSE OF PRE-DISSEMINATION PEER REVIEW UNDER APPLICABLE INFORMATION QUALITY GUIDELINES. IT HAS NOT BEEN FORMALLY DISSEMINATED BY [List your agency here]. *IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY*

In these instances, CCSP will not be posting a pre-dissemination draft of the SAP on the CCSP website. Additional information is attached (see May 19, 2005 memo from Jim Mahoney and Richard Moss).

4. Information Quality Procedures

As a lead agency for an SAP, you will be responsible for complying with the Information Quality Act. Section 515 of Public Law 106-554, known as the Data Quality Act, required the Office of Management and Budget to promulgate guidance to agencies ensuring the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies. OMB's government-wide guidelines, published as interim final on September 28, 2002 (66 F.R. 49718) and finalized on February 22, 2002 (67 F.R. 8452), can be found on OMB's OIRA's website
http://www.whitehouse.gov/omb/inforeg/agency_info_quality_links.html.

To facilitate any requests that might ensue pursuant to this statute, it is a good idea that you advise each of your authors to:

a. Retain a copy of any document they cite;
b. Identify specific pages in the literature they cite, where appropriate; and
c. Use explanatory footnotes when the text extends beyond a fact cited in the literature.

Each product team should also be prepared to make available any data it uses in the report's charts or figures. These data should be publicly available as early as the expert review and public comment phases and should remain available thereafter.

5. FACA (The Federal Advisory Committee Act)

The determination of whether a FACA committee is needed rests with the lead agency for the SAP. When a FACA Committee is required, the lead agency is responsible for establishing the FACA charter and the process for appointing FACA Committee members. Note that there are specific requirements for Federal Register announcements when a FACA Committee meets and each SAP lead agency is to comply with its own agency FACA rules. Originally, CCSP was going to provide guidance on the FACA process, but we realized that such guidance would possibly subordinate agency procedures that have already been adopted. Thus, it is up the assigned agency to comply with FACA accordingly.

6. Progress Reporting

6.1. Introduction

In an effort to streamline the communications process among the U.S. Climate Change Science Program (CCSP) Synthesis and Assessment Products (SAP) lead authors, the CCSP Office (CCSPO) has developed a Web-based system for entering and tracking the status of the various SAP products.

The SAP status tracking system was designed using a commercial Web-publishing software package called ExpressionEngine. The two main components through which users will use this system are the Control Panel page and the end-user Status page, both of which are password-protected. The Control Panel page is the administrative interface where you will enter SAP status information. Once entered, the information will be available on the SAP Status page: http://www.usgcrp.gov/sap/status/

Note that the software was upgraded in February 2006. These instructions are revised to reflect changes in the program's Administration Panel.

6.2. Logging on

To access the Control Panel page, go to:
http://blogs.usgcrp.gov/system-20050124-admindir/index.php

and enter the username and password you were provided.

There is also a link to the Control Panel page from the main SAP site:
http://www.usgcrp.gov/sap/

6.3. Editing SAP Status Entries

The Control Panel page will have a menu bar on the top with the following tabs:

PUBLISH | EDIT | MY ACCOUNT

To edit the information for a particular SAP, click on the **EDIT** tab. On the EDIT page, select "Synthesis and Assessment Products (SAP) Status" from the dropdown menu at the upper left. Beneath that dropdown box, select "Alphabetical" from the "Order" dropdown menu. Then click

on the **Search** button. This will produce a complete list of the SAPs. Find the product you wish to edit and click on the product name.

That will take you to a 3-tab editing page. The three tabs are:

PUBLISH FORM | DATE | CATEGORIES

Start with the "Publish Form" tab

A. "PUBLISH FORM" TAB

a) Entering and Selecting Information

"Title"

This will already be entered and should **NOT** be changed in any way, as this will change the hyperlink to the product.

"Full Product Name"
"Status Summary"
"Immediate Concerns"
"Action Required (what and by whom)"
"Communications Activities, Stakeholder Interaction"
"Product's Public Home Page"

These fields are each set up as text boxes. Simply enter the appropriate information in the fields.

The remaining fields are set-up in the form of a dropdown menu followed by a text field and relate to the following items:

- FACA Process Initiated
- FACA Charter completed
- Draft Prospectus Completed
- Draft Prospectus Approved by CCSP
- Draft Prospectus Publicly Reviewed
- Prospectus cleared for publication
- Prospectus published
- First draft completed
- Expert review completed
- Second draft completed
- Second draft publicly reviewed
- Third Draft Completed
- CCSP Review Completed
- Approved by NSTC
- Published on the Web
- Hardcopy published

For each item, the dropdown menu indicates whether or not the item has been completed (the options are "Yes" and "No") and the date on which it was completed. Where noted on the form, please enter the date in the yyyy-mm-dd format:

2005-12-31 (not 31 December 2005; 10 December, 2005; Dec. 31, 2005 or 12/31/05)

Click the blue and white "Quick Save" button in the green box near the upper right portion of the PUBLISH page to save your changes.

b) HTML Formatting and Adding Links

In any of the text fields, you can apply standard HTML formatting to any text you wish, including bold, underline, etc. You can also add hyperlinks to Web sites or e-mail addresses and even images, should you so desire.

All of these formatting options are controlled via the html toolbar:

To embed Web link in part of the text, select the text and click the **Link** button on the html toolbar and enter the corresponding URL. You will automatically be prompted to enter the title for the hyperlink. This is the text in which the link will be embedded. By default, this will be the text you selected. You will also be prompted to enter a "title attribute," which is the text that will appear when users hold their mouse pointers over the link. Again, by default, this will be text that you selected. You can also add a Web link without first selecting text in which to embed it.

You can also add or embed e-mail addresses anywhere in text field. The process is similar to that of adding or embedding a Web link. You can either select text (typically a person's name or e-mail address) in which to embed the link or simply add it from scratch. In either case, start by clicking the **Email** button. You will be prompted to enter an e-mail address and a link title. If you select text before clicking the **Email** button that text will be entered as the default link title. You can also leave the link title field empty if you would like the e-mail address to be displayed at the link title (note: if you select text but leave the link title field blank, the selected text will be replaced with the e-mail address).

You can add an image (such as a logo) to an event entry by clicking the **Image** button. The image must already reside somewhere on the Web and you will be prompted to enter the URL for the image. It is possible to change the size at which an image is displayed, but to do so requires manually entering the appropriate html code after the image source tag.

You can apply various html tags to text anywhere in the entry. These include **bold** (<b>), *italics* (<i>), <u>underline</u> (<u>), (<bq>) and ~~strikethrough~~ (<strike>). To apply any of these tags, first select the text to which you want the tag applied and click the appropriate button on the html toolbar. The html tags will automatically be inserted around the selected text.

Don't forget to click the blue and white "Quick Save" button in the green box near the upper right portion of the PUBLISH page to save your changes.

<u>B. "DATE" TAB</u>

Go to this tab to enter the date on which this SAP was last updated. As this date is not automatically entered, it is important that you enter the date on which you make any changes to an SAP product's status information.

You can either enter the date in the text box or click on the "Date Calendar" icon to select the date.

If you are not planning any further changes, click on the "Update" button on the right side of the screen. If you wish to make additional change under one of the other tabs (CATEGORIES or PUBLISH FORM), click "Quick Save" to save your changes before going to the another tab.

"Expiration Date"

Please ignore this field, as it does not apply to the SAP status information.

C. "CATEGORIES" TAB

As various steps of a product's review, submission, and release are completed, progress should be indicated by selecting all completed steps listed in the "Categories" tab. The various steps available are:

Draft Prospectus Publicly Available
Final Prospectus Publicly Available
Peer review of First Draft Product Completed
Public review of Second Draft Product Completed
Third Draft Product Submitted to CCSP
Product Submitted to NSTC
Final Product Released

If only the first step (Draft Prospectus Publicly Available) has been completed, select only that step. If multiple steps have been completed, hold down the Shift key and select the most recent step. This should ensure that *all* completed steps are selected.

If you are not planning any further changes, click on the "Update" button on the right side of the screen. If you wish to make additional change under one of the other tabs (DATE or PUBLISH FORM), click "Quick Save" to save your changes before going to the another tab.

6.4. Questions/Help

For general questions relating to the ExpressionEngine blog software, you can try searching the online user guide. Simply click the User Guide link on the top-right corner of the window to access the guide, which will open in a new window.

If you cannot find the answer to your question in the User Guide or if you have a specific question relating to an event you entered, please contact Nick Sundt at nsundt@usgcrp.gov and he will be happy to assist you.

7. Communications

Communications is one the four overarching pillars of the Climate Change Science Program. Developing a sound, comprehensive communications strategy for the release of each Synthesis and Assessment Product (SAP) should be a priority for the responsible lead agencies in order to broadly share and promote the findings of these considerable efforts.

This document offers recommendations for developing communications plans for the SAPs as well as lessons learned from communications activities that were conducted for SAP 1.1. It is intended for SAP lead authors and their associates.

This is a living document. As more SAPs are publicly released and new knowledge is gained on successful communications strategies, this document will evolve. The CIWG and SAPAG encourage individuals involved in SAP communications activities to provide feedback based on their experiences.

7.1. Communications Plan Guiding Principles

- Communications are responsibility of Lead Agency for each product, and a critical component of each SAP.
- Early on: Determine what needs to be done, by whom and when
    - Develop calendar/timeline with specific events and dates
- Identify in prospectus detailed communications strategies including the identification of key stakeholders
- Engage stakeholders throughout the process by developing contact lists, soliciting feedback on drafts and convening workshops and briefings
- Consult with CIWG and SAPAG, and request guidance/assistance as necessary
- Consider embedding a communications expert in the report writing process and/or an editor
- Keep lead agency public affairs and communications offices informed of product process and progress from the beginning; keep Executive Office of President (EOP) informed through CCSP
- Allow for flexibility in planning communications-related activities given the possibility of changing timetables

7.2. Elements of Communications Plan and Recommendations

- Dissemination Materials – produce consistently presented materials in both hard copy and electronic form (for dissemination via web and email); all dissemination materials, other than the press release, should be approved by the author team and peer-reviewed along with the entire report.
    - Executive Summary* (see Appendix 1)
        - Ideally 2-4 page summary (no longer than 8 pages) written at high school reading level, including easy to understand figures and background, explaining the relevance of the report.
        - A communication professional and/or CIWG representative could help produce this overview.
        - Available within the SAP or as a stand-alone product
    - Full report
        - Develop list of stakeholders for electronic and hard copy distribution

    - Press release
- Talking points and questions and answers
    - Prepare iteratively with lead agency's Office of Public Affairs and in coordination with CCSPO prior to final product release
- Legislative briefing(s)
    - Following the expert review and revision stage (*optional*)
        - Work with CCSP/Lead Agency Congressional offices to prepare list of legislative contacts
        - Notify EOP via CCSP and appropriate officials at Lead Agency about the Product and intent to notify Capitol Hill
        - Offer optional briefing to Hill and schedule upon request
    - Release of final report
        - Notify EOP via CCSP and Lead Agency of intent to schedule Hill briefings
        - Schedule Hill briefings
- Reporters briefing
    - Plan ahead—give reporters sufficient notice of briefing (about 1 week)
    - Provide reporters with pre-reading: embargoed press release, executive summary and abstract 1 day in advance of public release
- Constituent briefing
    - Plan ahead of time:
        - identify speakers
        - determine who to invite and how to publicize
        - assess venue options and location
    - Convene shortly after product release date (within two weeks after release for maximum effectiveness.)
    - Keep it short and simple (should not have more than three speakers, and should not last more than 90 minutes, dividing the time between presentations and open Q&A). Discussion should focus on implications / relevance, rather than detailed technical discussions.
- Evaluation Metrics
    - Track and report:
        - Who signed up to receive the report and who the report was distributed to (in hard copy and electronically)
        - Website downloads and related analytics
        - Media coverage

7.3. Role of CIWG

- May serve as an informal consultant for any aspect of the development of S&A Product communications plans
- Lead agencies' CIWG members may provide useful assistance in writing/reviewing communications products (press releases, executive summary, etc.), planning/convening briefings and workshops, and disseminating products
- Contact CIWG Co-Chairs Kent Laborde <kent.laborde@noaa.gov> and Jason Samenow <samenow.jason@epa.gov> for guidance/assistance

***Appendix 1: Executive Summary Guidance (from CIWG Implementation Plan through 2007)**

Since many of the constituencies that are within the intended audience for the SAPs are not specifically scientific, it is essential to provide a plain-language overview to accompany the technical body of the SAP, or possibly stand alone in certain circumstances. There is great utility in providing a non-technical explanation of findings contained within the SAP, as described in the CCSP Strategic Plan Communications Section. The Executive Summary would be produced by the author team and would expect the same expert review and clearance procedures required of the overall body of the SAP. It should be no longer than eight pages, and should be written with a non-technical reader in mind.

SAP lead author teams will prepare the Executive Summary with assistance from the CIWG, as requested.

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[1] SAPAG Membership

Michael Slimak, EPA and Chair
Fabien Laurier, CCSPO
Clare Sierawski, DOT
Jerry Elwood, DOE
L. Dewayne Cecil, NASA
Tom Armstrong, USGS
Rick Rosen, NOAA
Margaret Walsh, USDA

8. Guidance to SAP Agency Leads on Handling Uncertainty

Synthesis and assessment of scientific findings exists at the interface of discovery and societal need – it is an interdisciplinary, collaborative production and communication of *knowledge*, not just *information*. A healthy synthesis and assessment process must explicitly address uncertainty. This is necessary to solidify the credibility of the research effort underlying the assessment, to build trust from stakeholders, clients, and users, and ultimately to produce something relevant.

The 21 U.S. Climate Change Science Program (CCSP) Synthesis and Assessment Products (SAPs) cover observations of past and present climate change, climate drivers, model-based projections of future climate change, vulnerability and impacts, and decision support. Characterizing, quantifying, and communicating uncertainty in climate change assessments presents challenges for a variety of reasons, including multiple spatial scales from global to local; long timescales (compared to instrumental records) and long time lags between forcings and responses; reliance on linked systems of complex models; nonlinear interactions between systems; lack of near-term verification of future predictions; and participation of subject experts from multiple disciplines, each with different norms for treating uncertainty.

Recently, the Intergovernmental Panel on Climate Change (IPCC) and the CCSP have produced a small number of guidance documents on handling uncertainty in climate change assessments. Notably:

Moss, R. and S.H. Schneider, 2000: Uncertainties in the IPCC TAR: Recommendations to lead authors for more consistent assessment and reporting. In: Guidance Papers on the Cross Cutting Issues of the Third Assessment Report of the IPCC [Pachauri, R., T. Taniguchi, K. Tanaka (eds.)], World Meteorological Organisation, Geneva, Switzerland, 33-51.

IPCC, 2004: Workshop on Describing Scientific Uncertainties in Climate Change to Support Analysis of Risk and of Options. Working Group I Technical Support Unit, Boulder, Colorado [Manning, M., M. Petit, D. Easterling, J. Murphy, A. Patwardhan, H.-H. Rogner, R. Swart and G. Yohe (eds.)], May 11-13, 2004, National University of Ireland, Maynooth, Co. Kildare, Ireland, 146 pp. Available at:
http://ipcc-wg1.ucar.edu/meeting/URW/product/URW_Report_v2.pdf.

Morgan, M.G., H. Dowlatabadi, M. Henrion, D. Keith, R. Lempert, and T. Wilbanks, 2006: Best practice approaches for characterizing, communicating and incorporating scientific uncertainty in climate decision making. SAP 5.2 [report in draft form].

This memo distills certain key themes, lessons, and recommendations from these reports, drawing most heavily from SAP 5.2, to provide guidance for SAP Agency Leads.

8.1. Types of Uncertainty:

Qualitatively different types of uncertainty need to be considered and addressed when presenting scientific findings. Most literature makes a distinction between “statistical” uncertainty and “structural” uncertainty: a number of related terms are also employed, often interchangeably. Statistical uncertainty refers to parameters or observed values that are not known precisely. Structural uncertainty refers to a basic lack of knowledge about processes and relationships that

we wish to capture: i.e., whether or not our conceptual model of the world accurately reflects reality and the extent to which our physical/analytical/numerical models encapsulate this understanding. The difference between the two is sometimes summarized as uncertainty resulting from lack of information versus that resulting from ambiguity or disagreement over what is known (or even knowable). Quantifying structural uncertainty is generally much less straightforward and consequently generally receives less attention in the scientific literature, even though it is arguably more important when dealing with climate change.

Sources of statistical uncertainty relevant to climate change include lack of data; inadequate or incomplete measurement; variation arising in measurement instruments and methods; systematic error and the subjective judgments needed to estimate its nature and magnitude; and inherent randomness and variability of natural systems.

Sources of structural uncertainty relevant to climate change include inadequate or incomplete measurements and data which prevent the elimination of plausible alternative hypotheses; systematic errors which drive misleading interpretations of underlying mechanisms; inadequate imagination and inventiveness in suggesting model structures; disagreement among different experts about interpreting available evidence; incomplete or competing conceptual frameworks; and ambiguous system boundaries or definitions.

8.2. Communicating Uncertainty in SAPs:

Critical information about the nature and sources of uncertainty are easily buried in imprecise and opaque language.

It is important to recognize the basic differences between descriptions of uncertainty in terms of "likelihood" or in terms of "level of confidence" of the science. Likelihood is the chance of a defined occurrence or outcome, expressed in a probabilistic way. Level of confidence refers to the degree of belief in the scientific community that available understanding, models, and analyses are accurate, expressed by the degree of consensus in the available evidence and its interpretation. Both are important when dealing with climate change and both must be communicated.

When expressing likelihood, there are many words used to describe different degrees of uncertainty: "probable," "possible," "almost impossible," "likely," "unlikely," etc. Such qualitative language is inadequate because the same words can mean very different things to different people, and the same words can mean very different things to the same person in different contexts. The above-cited guidance documents strongly urge assigning subjective numerical probabilities to such qualifiers and applying them consistently.

When dealing with the level of confidence in our scientific judgments about climate change and its impacts, it is important to consider two attributes: the amount of evidence available to support the judgment being made and the degree of consensus within the scientific community about that judgment. The state of knowledge underlying any judgment can then be sorted into, for example, four categories (as in Fig. 1.1 in SAP 5.2): well established; established but incomplete; competing explanations; and speculative.

8.3. Key Issues Related to Scenarios and Modeling

Most of the SAPs, particularly those falling under Goals 2, 3, and 4, draw in some way from future scenarios of socioeconomic changes, and the model projections of climate changes and impacts driven by this forcing. In this context, a few additional reminders:

- Models contain a huge variety of explicit and implicit expert judgments, each to some degree subjective.
- Uncertainty tends to increase going from global to regional to local scales. This is because of increased inherent climate system variability at smaller scales and resolution limitations of our observational data and modeling tools.
- "Downscaling" of coarse-resolution climate information to finer scales, for example using statistical methods or high-resolution regional climate models, introduces additional uncertainties.
- Uncertainty tends to increase going from a climate system change to an ecosystem or human impact. This is because of the resolution issues mentioned above, the nonlinear dependence of many impacts on changes in climate system variables, and the relatively less well developed models of these impacts.
- Techniques such as ensemble prediction, Monte Carlo analysis, etc. can add probabilities to model-based findings. These formal probabilities will only capture a portion of the total uncertainty of the overall problem.
- Increased "convergence" (across simulations from different models) and reduced "bias" (in the ability of models to reproduce observed past and present conditions), along with similar metrics, are not guarantors of improved simulations of future conditions.
- Unpredictable behaviors emerge when system complexity increases and multiple feedbacks interact (for example, when linking together multiple models or going to higher resolution). It is particularly important not to underestimate uncertainty when assessing the possibility of threshold effects and low-probability but high-consequence events from current scientific understanding and modeling tools.
- It is much more difficult to handle socioeconomic and technological factors underlying emissions scenarios, or, similarly, mitigative or adaptive capacity, deterministically, as compared to predictions about the future physical state of the climate system. Therefore, quantifying uncertainty associated with any particular socioeconomic scenario or assumption about future human responses is less meaningful than defining how a set of scenarios bounds the ranges of a few key variables and being explicit about which factors are and are not considered, and/or only considered exogenously.

Bear in mind that our understanding of complex problems such as climate change may grow richer without any reduction in perceived levels of uncertainty. Reduced uncertainty in some areas may be offset by newly-revealed processes or unanticipated complications. Therefore, *efforts to identify and understand the full range of uncertainties* is a role for the assessment process that is just as critical as identifying where research has narrowed the ranges of specific uncertainties.

8.4. Bottom Line Guidance:

CCSP is not providing prescriptive guidance for handling uncertainty in the production of the 21 SAPs. Rather, in the context of the topic of their SAP, each lead Agency is expected to address uncertainty explicitly by drawing on the guidance summarized here and the above-cited references. Agency leads are advised to

(1) Instruct authors to incorporate explicit discussions of uncertainty throughout their report. There should be a clear assignment of responsibility for this within the author team.
(2) Instruct authors to familiarize themselves with the material contained in the above-cited guidance documents.

(3) Instruct authors to create a checklist of sources of uncertainty, organized under the two fundamental types, statistical and structural, and to apply this checklist when developing the findings of their report. For each major finding, identify the most important sources that are likely to affect the conclusions.
(4) Instruct authors to use uncertainty qualifiers precisely and consistently, with associated subjective probabilities, when expressing likelihood.
(5) Instruct authors to express the level of confidence in the current scientific understanding of an issue by being transparent about the amount of evidence available and the degree of consensus in the scientific community surrounding that issue. In the face of wide disagreement in the literature, presenting the range of views represented is often more meaningful than attempting to enforce an artificial consensus.

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